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Antagonistic activity of *Trichoderma* against root rot causing fungi of soybean

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Abstract
In the present investigation an attempt has been made to evaluate the antagonistic activity of *Trichoderma* against root rot fungi of Soybean, eight different fungi like *Fusarium solani, Macrophomina phaseolina, Fusarium oxysporium, Phytopthora sojae, Fusarium moniliforme, Fusarium roseum, Rhizoctonia solani, Sclerotium rolfsii* were tested. *Trichoderma* retarded the growth of *Fusarium moniliforme* completely (85 mm) followed by *Rhizoctonia solani* (81.5 mm), *Fusarium oxysporium* (80 mm), *Fusarium solani* (79 mm), *Fusarium roseum* (79 mm), *Phytopthora sojae* (76 mm), *Macrophomina phaseolina* (73.5 mm). Minimum growth of inhibition is shown against *Sclerotium rolfsii* (61 mm).

Keywords: antagonistic activity, *trichoderma, fusarium moniliforme*, *sclerotium rolfsii,* root rot

Introduction
Soybean (*Glycine max* (L.) merr.) is an important oil seed crop and is grown in several tropical and sub-tropical countries. It is said to be the poor man meat that grows on plant. Sustainable soybean production is continuously challenged by diseases that cause quantitative and qualitative losses in yield. Most wide spread among these are foliar diseases and root diseases. It has been reported that soybean plants are subject to the infection by several soil-borne pathogens, inducing root rot disease, which is considered among the most important limiting factors affecting plant growth and yield (Cook *et al*. 1995; Yang & Feng 2001) [1, 5].

Farmers use pesticides and fungicides for the control of plant diseases but it is very harmful, expensive and not environment friendly, leads to development of resistant strains. In this regard biological control offers an alternative solution for long term sustainability and effective management of soil borne diseases. *Trichoderma* which is a common saprophytic filamentous fungi in almost any soil and rhizosphere micro flora, is well recognized as bio control agent against various plant pathogenic fungi. Different mechanisms have been suggested for its bio-control activity, which include competition for space and nutrients, secretion of lytic enzymes, mycoparasitism and production of inhibitory compounds. (Pandey *et al.*, 2005) [4]. *Trichoderma* sp. is one of the most important bio control agent used for management of different diseases (Harman, 2004) [2]. *Trichoderma* spp. are free living fungi that are common in soil and root ecosystems and promote plant growth (Yedidia, 2001) [6]. *Trichoderma* spp. are effective in control of soil/seed-borne fungal diseases in several crop plants (Kubicek *et al.*, 2001) [3].
The objective of this study was to evaluate the use of *Trichoderma* in the bio control against root rot fungi of Soybean.

Materials and Methods
The materials used in the present investigation and methods followed given below:
All *in vitro* studies on root rot causing fungi like *Rhizoctonia solani, Phytopthora sojae, Macrophomina phaseolina, Fusarium solani, Fusarium oxysporium, Fusarium roseum, Sclerotium rolfsii,* were conducted in the Department of Botany Vivekanand Arts, Sardar Dalipsingh commerce and Science College, Aurangabad.

Evaluation of Antagonists
Trichoderma were sub cultured from previously isolated stock culture of the Department of Botany Vivekanand College, Samarth Nagar, Aurangabad. And this culture were evaluated for their antagonistic activity against root rot causing fungi of Soybean, *Fusarium solani, Macrophomina phaseolina, Fusarium oxysporium, Phytopthora sojae, Fusarium moniliforme, Fusarium roseum, Rhizoctonia solani, Sclerotium rolfsii.*

In vitro evaluation of antagonist by dual culture technique
Trichoderma were screened for their antagonistic activity against root rot fungi of soybean by dual culture technique on PDA (Potato dextrose agar) in Petri plates. Twenty ml of PDA medium is poured in pre sterilized Petri plates. On solidification seven day old culture of both antagonists and test fungi were inoculated on the periphery of each Petri plate. In control test fungi were inoculated without antagonists, triplicate were maintained for each Pathogen. Plates were incubated at $25^0 + 2^0$ C. Observation were made and diameter of zone of inhibition was measured in (mm).

Results and Discussion
Dual culture technique (In-vitro study)
The antagonistic activity of *Trichoderma* was studied under *in vitro* condition against *Fusarium solani, Macrophomina phaseolina, Fusarium oxysporium, Phytopthora sojae, Fusarium moniliforme, Fusarium roseum, Rhizoctonia solani, Sclerotium rolfsii* by dual culture technique and data presented in table.
Trichoderma shows antagonistic activity against all root rot causing fungi of Soybean. Maximum growth of inhibition is shown by *Trichoderma against Fusarium moniliforme* (85 mm)

followed by *Rhizoctonia solani* (81.5 mm), *Fusarium oxysporium* (80 mm), *Fusarium solani* (79 mm), *Fusarium roseum* (79 mm), *Phytopthora sojae* (76 mm), *Macrophomina phaseolina* (73.5 mm). Minimum growth of inhibition is shown against *Sclerotium rolfsii* (61 mm).

It is evident from table no.1 that *Trichoderma* totally arrested growth of *Fusarium moniliforme* and it is less efficient against *Sclerotium rolfsii* isolated from soybean causing root rot. These findings were compared with other worker, Zape *et al.* (2014) tested efficacy of ten different antagonist against the *Sclerotium rolfsii*, *Rhizoctonia solani* and *Fusarium solani* maximum inhibition in radial growth of *Sclerotium rolfsii* was observed with *P. fluorescens* (71.85%) followed by *T. harzianum* (65.56%), *T. viride* (A) (65.19%) and *G. virens* (A) (61.48%), it was minimum with G. virens (P) (31.11%) followed by *T. koningii* (34.81%), *T. viride* (43.33%) and *T. lignorum* (44.81%).

Table 1: Antagonistic activity of *Trichoderma* against root rot Fungi of Soybean

S. No	*Trichoderma* against test fungi	Diameter of zone of inhibition in mm	
		Trichoderma	Test fungi
1	*Trichoderma + Fusarium solani*	79 mm	32.5 mm
2	*Trichoderma +Macrophomina phaseolina*	73.5 mm	47.5 mm
3	*Trichoderma + Fusarium oxysporium*	80 mm	26 mm
4	*Trichoderma + Phytopthora sojae*	76 mm	29 mm
5	*Trichoderma+ Fusarium moniliforme*	85 mm	14 mm
6	*Trichoderma + Fusarium roseum*	79 mm	22.5 mm
7	*Trichoderma + Rhizoctonia solani*	81.5 mm	20.5 mm
8	*Trichoderma + Sclerotium rolfsii*	61 mm	64 mm

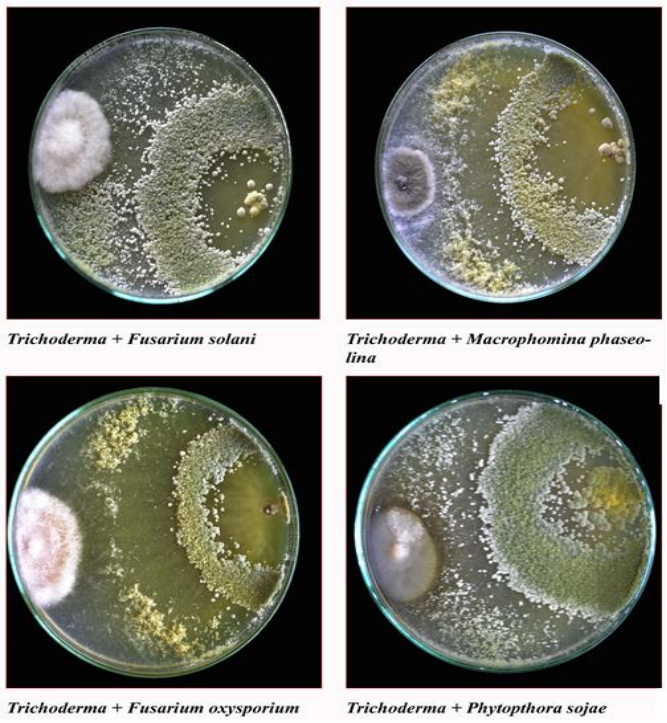

Fig 1: Antagonistic activity of Trichoderma against root rot fungi of Soybean

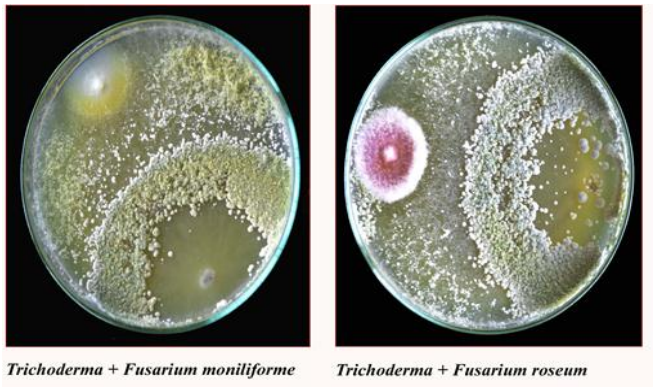

Fig 2

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